# SCIENCE.

FRIDAY, MAY 14, 1886.


## COMMENT AND CRITICISM.

A VERY IMPORTANT contribution to the discussions which are now in progress with respect to the scientific work of the United States government has reached us within the last week. It is a voluminous report of the testimony elicited by the joint congressional commission, of which Senator Allison is chairman, from the time when it began to act, Dec. 4, 1884, until Jan. 30, 1886. This evidence was presented in the senate on the 16th of last March, and ordered to be printed. It constitutes a book of more than eleven hundred pages, in which a very copious and well-arranged index is included. The first portion of this volume, including the evidence which was collected during the first winter of the commission's service, has long been in type, and has been the basis of some of our previous comments. The latter half, including the testimony taken last December and January, is new to us, and to that alone we now call attention. In the *personnel* two changes were made at the beginning of last winter: Senator Morgan took the place of Senator Pendleton; and Mr. John T. Wait, a representative for Connecticut, the place of Mr. Theodore Lyman, a representative for Massachusetts. Fourteen sessions were held during the two months just named, and the principal officers of the coast survey, the geological survey, the hydrographic survey, and the signal service, were examined. In addition to their testimony, communications are also printed from Simon Newcomb and Alexander Agassiz.

In a somewhat rapid examination of this volume, we discover a vast amount of detailed information in respect to the conduct of scientific work by the government, but we do not perceive any fresh contribution to the discussion of the principles which should govern the organizations. There is nothing to indicate the conclusions of the commission, though the bias of individual members may be surmised from their interrogations. It would appear as if the commission had pursued their inquiry with fairness and thoroughness, and with a sincere desire to set before congress the exact condition of affairs. It is a pity that some competent person had not been employed to digest the information thus laboriously collected, and to present in a colorless summary the suggestions which are made, *pro* and *con*, as to possible changes. Professor Newcomb (Jan. 15, 1886) succinctly describes the situation from his point of view, pointing to "the want of adequate administrative supervision of the work of those bureaus," and declaring that he sees but one remedy, — "to place all the scientific work of the government properly so called under a single administrative head, to be selected by the President." The remarks of Professor Agassiz discriminate between the work which legitimately belongs to the government and that which does not; and he refers (Dec. 2, 1885) to a note which he has written to the *Nation*, embodying his ideas in regard to all this government business.

Major Powell, in a letter to the commission, has presented some criticisms of the changes proposed. He says "that the bill [brought before congress by Mr. Herbert], in prohibiting the expenditure of any money for paleontological work or publication, except for the collection, classification, and proper care of fossils and other material," practically provides for exactly the paleontological work now being prosecuted by the survey, but prohibits its publication. He also calls attention to the popular misunderstanding of the scientific conception of a theory. The bill prohibits "the general discussion of the geological theories." If this is used in the scientific sense, it prohibits any classification, or suggestion of the possible co-ordination, of the recorded facts. In view of the absolute necessity of the geological survey prosecuting all branches of research which can in any way bear upon the knowledge sought, it would be more reasonable for congress to provide for curtailing the expenses of the bureau, causing the depletion to fall upon the entire organization, rather than to commit the error of lopping off some branch or branches of the work.

THE QUESTION OF THE PLACE and character of the moral and religious instruction at Harvard

was officially settled by the board of overseers last week. The subject has excited great interest, because Harvard is generally looked to as the leader in the matter of higher education in this country; and it was pretty generally felt that whatever course Harvard should take in this regard would be quite generally followed, in the course of time, by other institutions of learning. Pending the settlement of the question, — and it was one which a conscientious president or overseer could not settle in a day, — the Harvard authorities and one or two of the professors have been subjected in some quarters to a criticism which was as unnecessary as ill-timed. A deliberative body of any force of character is not to be deterred from doing its duty as it sees it, by the noisy clamor and abuse of *ex-parte* advocates. The subject is now settled, and it will give general satisfaction when it is known that the guiding principle of the solution found is unsectarian Christianity. Whether this will be found possible of attainment in practice is a question, but the overseers have provided for it as best they could. Rev. Francis S. Peabody becomes Plummer professor of Christian morals, and head of the department of religious instruction in the college. He will also be the university pastor. As coadjutors, Professor Peabody is to have five college preachers, who are to be clergymen of reputation and large experience. These college preachers will, with the professor, have charge of the chapel services and of the religious instruction. As we understand the scheme, each college preacher is appointed for a year, but fulfils the duties of his position only one-fifth of the time. In this way a constant succession of able clergymen of various denominations will be in co-operation with Professor Peabody. In theory this plan seems excellent, but we shall await its practical application with interest and not a little incredulity.

THAT SCIENTIFIC MEN believe that the claim of Pasteur has merit enough to entitle it to investigation, if not to credence, is evidenced by the fact that commissions are being sent to Paris to examine into the methods now practised for the prevention of rabies. The English government has appointed such a commission, having selected some of the most eminent men in the kingdom. Sir James Paget, T. Lauder Brunton, Sir Henry Roscoe, and Burdon Sanderson are names which will satisfy every one that justice and caution will be exercised in the inquiry. Germany, by the selection of Virchow and Koch, has shown her interest in the matter. The Academy of medicine of Rome has sent delegates for the same purpose; while the Archduke Charles Theodore of Bavaria, a physician, has started for Paris to make an investigation on his own account. It would seem reasonable to expect some decided results from an investigation made by such talented men as most of them are known to be, and that the truth or falsity of Pasteur's claim was in a fair way to be established beyond a peradventure.

IT IS TO BE HOPED that congress will not fail to pass the bill authorizing the appointment of a commission to inquire into the merits of inoculation for the prevention of yellow-fever. This bill was introduced at the instance of Dr. Joseph Holt of New Orleans, and has received the indorsement of the American public health association. From the daily press we learn that the physicians of the military garrison at Vera Cruz have already commenced inoculations for the prevention of yellow-fever. The material employed is injected hypodermically at intervals of eight days. Such a commission as could be selected from this country could establish the value of this method of prevention of yellow-fever, so strongly advocated by Freire and Carmona.

## *A TASK FOR ANATOMISTS.*

"WALLACE," writes Oscar Schmidt, "might well say that we live in a world which is zoölogically very impoverished, and from which the hugest, wildest, and strangest forms have now disappeared." But old as the world appears, who shall say that it has passed or even reached maturity — if so be that worlds, like animals, have their day, as some have been bold enough to assert? It is true that the fishes no longer predominate, that the reptiles have dwindled into insignificance, and that of the mammals only a handful of great forms remain. But another type, the last to appear, and, of all, the most notable, — man, — is in the ascendant. His age is but begun. If we look upon the world of to-day as poorly furnished with striking animal forms, what must be the verdict of the man of the fiftieth or sixtieth century, when Europe will be a chain of cities, Africa and South America densely peopled continents, and North America the home of a population to be counted by hundreds of millions! The increase of powerful appliances for the subjection of the earth to human needs, within the memory of men now

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living, is without parallel, and there is no indication that the climax has been reached. It is not, indeed, improbable that our age may come to be looked upon as plodding and unprogressive.

It is not, however, to the development of the world's resources to which I would direct attention, but to some of the effects impending from the ascendency of many, and the duty of zoölogists in connection therewith.

Some of the great changes in the zoölogical condition of the globe, incident upon the increase of human populations, the extension of railroads and the introduction of steam-power and horse-power, agricultural machinery, and the general use of perfected fire-arms, are familiar to everybody. The existence of vast herds of bison on the western plains of North America has become a matter of history. The aurochs, the bison's European cousin, is likewise menaced with destruction. "It no longer exists," says M. de Tribolet, "but in the condition, as one may say, of a living zoölogical specimen." Similarly the bands of destruction are daily tightening about the wapiti, the moose deer, the antelope, the manatee, and the mountain sheep and mountain goat, in North America; the chamois, the wild goat, the beaver, and the stag, in Europe; the kangaroo, in Australia; the elephant, the gorilla, and the chimpanzee, in Africa; and a score of other mammals, as well as birds and reptiles, in different parts of the world.

The reckless slaughter of some of these animals is painful to contemplate. "Some years ago," writes the author from whom we have just quoted, "a little family of beavers was discovered on an island in the Rhone; it was a happy accident, there was hope that we should see the revival of a species well-nigh extinct. All have been slaughtered without pity, — a folly which one could not have supposed possible, except among a non-civilized people, where the culprit is unconscious of his guilt." Words cannot entirely express the sorrow with which the true lover of nature witnesses the wanton annihilation of so many of the greatest and most interesting of living creatures.

But there is room for more than sorrow. There is good cause to fear, that, unless anatomists bestir themselves, many large species of vertebrates now existing will become extinct before their structure is at all thoroughly known. Gosse's dictum, that "it is better to err on the side of minuteness than of vagueness," should be applied to this matter. It would be best to lay aside thesis and hypothesis, and to record facts, — as many and as much in detail as possible. From the stand-point of to-day, rudimentary, defective, and 'nascent' structures attract an inordinate amount of attention, because of the light they shed upon the theory of evolution. But ten or twenty centuries hence a new theory may dominate, a new stand-point be taken, and a new standard adopted. Then the anatomical details we ignore may perhaps be diligently inquired into. We do not find fault with the early historians because they recorded so many facts, but because they recorded so few, and these so imperfectly. It may be that the fool *collects* facts, while the wise man *selects* them; but the wise man — the supreme genius — is one man of a million, and the fools had best content themselves with piling up the store of truths against his coming.

But whether fools or wise, posterity will certainly charge us with slothfulness if we fail to record, so far as our opportunities and appliances and the condition of zoölogical knowledge permit, the last details of the structure of those species of animals we know to be about to become extinct.

A work similar in character to this is being carried on at the present time by the Smithsonian institution's bureau of ethnology, the Davenport academy, and other similar organizations. American ethnographers have awakened to the fact that the study of the aborigines is becoming every day more difficult, and with most commendable zeal have set to work to record all that can be learned regarding the history, languages, religions, and customs of our Indian tribes. Let anatomists in all parts of the world follow the example of these investigators. In the case of vanishing peoples and species of animals, what the ethnographer and anatomist of to-day fail to record, the future archeologist and paleontologist can never find out, or can only guess at. F. W. TRUE.

## THE HISTORICAL ASSOCIATION.

THE American historical association held its third annual meeting at Washington on Tuesday, Wednesday, and Thursday, April 29–May 1. The venerable George Bancroft presided at all but two sessions, when the first vice-president, Mr. Justin Winsor, librarian of Harvard college, took his place. The sessions were held in the large hall of the Columbian university, and were well attended. Mr. Bancroft's address of welcome was very well received. It will be printed in the next number of the *Magazine of American history*. Gen. J. G. Wilson of New York followed with a paper on Columbus, advocating an international celebration of the discovery of America by the great explorer. At a subsequent meeting a committee was appointed to wait on the President, to ask him to call the attention of congress to the matter. It is understood that the President received the

deputation favorably, and will recommend co-operation with other powers in his next annual message. Prof. E. N. Horsford of Cambridge then read a paper on the landfall of John Cabot in 1497. The substance of it has already appeared in Mr. Horsford's letter to Judge Daly, printed in the journal of the American geographical society, and also in the form of a monograph. Dr. A. B. Hart of Harvard came next, with 'A description of some graphic methods of illustrating history,' with examples of some maps and charts actually used by him in his lecture-room. The paper was listened to with great interest. But the only paper of the morning which evoked discussion was one by Prof. M. C. Tyler of Cornell, on the neglect and destruction of historical materials in this country. The reverend doctor was most justifiably severe on the almost criminal way in which American families, with a few notable exceptions, have treated the papers left by their ancestors. Judge Mellen Chamberlain of the Boston public library agreed with Dr. Tyler, and, in addition, called attention to the duty that certain families who have inherited public papers from their ancestors owe to the public to return all documents that really form part of the public archives to the public depositaries, whether state or national; and a motion to that effect was introduced and carried. It may seem singular that such a motion should be necessary, but one hundred years ago it was by no means uncommon for a governor or secretary of state, on his departure from office, to take away with him such public papers as interested him; and to-day many documents which form, or rather should form, a part of the archives, are in the hands of persons who know nothing of their value, and take no more care of them than they take of their own family papers.

In the evening Mr. Charles Deane of Cambridge presented, in behalf of Mr. Alexander Brown of Nelson county, Va., a paper embodying what may be called the modern views of the early history of his state. The Hon. William Wirt Henry of Richmond followed with a paper describing the part taken by Virginia in establishing religious liberty under the leadership of his grandfather, Patrick Henry. As might have been expected, Mr. Henry did full justice both to his ancestor and his native state. Dr. Channing of Cambridge followed with an abstract of a paper on the social condition of New England in the middle of the last century. He especially emphasized the fact that in one corner of New England slavery then existed on an extensive scale. Mr. T. Jefferson Coolidge, jun., who has been studying with him the past year at Harvard, then read a carefully prepared paper on the development of municipal government in Massachusetts. He showed that the first charter of Boston was a direct outgrowth of the New England town system. Judge Chamberlain, in the course of some remarks on this paper, pointed out how completely the individual masses of Americans had become accustomed to organizing.

The morning session of the second day was opened by Edward G. Mason, Esq., of Chicago, with a thoroughly enjoyable essay on the march of the Spaniards across Illinois. This was in many respects the most valuable paper presented. It will shortly be printed in the *Magazine of American history*, and needs no further mention here. At this session Mr. William A. Mowry of the *Journal of education* presented his well-known views upon the disputed question as to whether the Louisiana purchase included Oregon. Mr. Mowry's argument is in many respects a strong one; but it may pertinently be asked, supposing that he is correct in his assertion that Oregon was not within the limits of that purchase, how did the United States acquire it? Mr. E. B. Scott of Wilkesbarre, Penn., closed the session with an account of the settlement of the lower St. Lawrence.

In the evening Prof. A. Scott of Rutgers led off with a paper on the origin of the highest function of the American judiciary, in the course of which he remarked that he thought that New Jersey had some share in the revolution, which, judging from the general drift of the papers, seemed to have been the exclusive work of Massachusetts and Virginia. Mr. J. M. Merriam, an undergraduate student at Harvard, then read a paper showing that the number of removals usually attributed to Jefferson was much too small. This paper attracted considerable interest, and was printed in full in one of the Washington daily papers. Another of Dr. Channing's pupils, Mr. A. B. Houghton, was put down for a paper on the international aspect of the Panama canal. He was unavoidably absent, and a very short account of his work was presented. The last paper on the list for the evening was an address by Dr. F. W. Taussig of Harvard on the early protection movement and the tariff of 1828, in which it was shown that the Jackson and Adams men so angled for the votes of all sections that the tariff of 1828, as passed, pleased no one. Mr. Henry Adams, whose history of the period from 1783 to 1812 is so anxiously awaited by students of American history, closed the session with a few remarks supplementary to Mr. Merriam's paper. He thought, however, that credit was still due to Mr. Jefferson for not making even more removals than, according to the essayist, he did make.

But the third day was in many respects the most interesting day of all. Gen. G. W. Cullum,

at one time commander at West Point, opened the morning session with an interesting account of the attack on Washington in 1814. He was followed by two of the lecturers in the course recently given at the Lowell institute in Boston, under the auspices of the Military historical society of Massachusetts, — Col. William Allan of Maryland, formerly on 'Stonewall' Jackson's staff; and Major Jedidiah Hotchkiss of Staunton, who served through the war on Jackson's, Lee's, Ewell's, and Early's staffs. Colonel Allan gave an exposition of the confederate and federal strategy in the 'Pope campaign' before Washington in 1862. His remarks were illustrated by two large plans of the scene of those operations, and were listened to with the greatest interest, even by those to whom the subject was not familiar. Major Hotchkiss followed with an illustration of the value of topographical knowledge in battles and campaigns. He drew on the board with colored crayons a map of Virginia to illustrate his remarks. His dexterity was viewed with wonderment by those in the audience who have tried — though unsuccessfully — to accomplish the same results. In the evening the attendance was even larger than at any previous meeting. Mr. Bancroft presided, and was the recipient of an ovation which was as unexpected as it was genuine and merited. Mr. Justin Winsor was elected president for the coming year, with President Adams of Cornell and William F. Poole of Chicago as vice-presidents, while William Wirt Henry of Richmond took Mr. Weeden's place on the council. At this session Dr. J. F. Jameson of the Johns Hopkins read an abstract of a very valuable paper on Usselinx, founder of the Dutch and Swedish West India companies. The venerable president of the Massachusetts historical society, Dr. George E. Ellis, spoke of the necessity of an occasional reconstruction of history. He gave as an example the work now being edited by Mr. Winsor, — 'The narrative and critical history of America.'

Altogether the meeting was a most enjoyable one. The papers were for the most part creditable to the association, and especially to its secretary, to whom the making-up of the programme was in great measure left. The one regrettable feature was the continued absence of papers on other than American history. Why is it that the teachers of other periods do not come forward? Surely there must be good work done in other fields; and the hearty reception accorded Professor Emerton last year showed that the members are interested in what many regard as really more historical subjects than the comparatively recent history of America. The absence of papers on economic subjects, and on matters of present discussion, was marked. Excursions to Arlington, Mount Vernon, and points nearer headquarters, filled up the spare hours, and the experiment of holding meetings in some place other than Saratoga may be regarded as highly successful.

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## PROPOSED ENGLISH FISHERY BOARD.[1]

I HAVE read with considerable interest Professor Huxley's memorandum on the proposed fishery board, and with much of what he says I agree. It seems to me, however, that attention is likely to be diverted from the real question demanding consideration, by Professor Huxley's attack upon certain persons unknown, who appear to have demanded in some newspaper which Professor Huxley has seen, that men of science should 'manage the fisheries.' That men of science should interfere with commercial speculation, and manage the fisheries in that sense, is a proposition so preposterous, that it is difficult to understand why Professor Huxley should have thought it worthy of notice.

The question which really demands consideration is another one altogether, and is simply this: Is it desirable that men of science should be definitely and permanently employed to manage the inquiries which are necessary in order that a satisfactory basis may be obtained for legislation in regard to a variety of fishery questions? And, further, is it desirable that such persons should be employed by the state in order to ascertain whether certain steps in the way of protection and cultivation of fishes can be usefully carried out by the state for the benefit of the community? Professor Huxley does not, in my judgment, attach sufficient importance to such inquiries, and the necessity for a permanent organization of officials to deal with them, when he says, "Let the department obtain such scientific help as is needful from persons of recognized competency, who are not under the control of the administrative department." This proposal seems to be somewhat inconsistent with another statement in the memorandum, where Professor Huxley says, "I should say that any amount of money bestowed upon the scientific investigation of the effect of some modes of fishing might be well spent." If 'any amount of money' is to be spent, and so large a question as 'the effect of some modes of fishing' is to be investigated scientifically, then it would seem well that the department should have a trained and permanent staff of expert naturalists, and a scientific authority to direct their inquiries.

The fact is, that enough time and money have

[1] From the *Journal of the society of arts*, April 30.

been spent by the state upon spasmodic inquiries into the effects of trawling, and the various questions the rapid investigation of which has from time to time appeared to be 'needful.' What is now needed is a more systematic and determined attempt to grapple with some of the more important questions, the solution of which is likely to affect the interests of the fish industry.

I have drawn up a brief statement on the subject of the relation of scientific investigation to fishery interests, which, in no dogmatic spirit, but with a view to eliciting criticism and suggestion, I here submit to the reader: —

1. The necessity for an administration of our marine and fresh-water fisheries, based upon thorough or scientific knowledge of all that relates to them, has become obvious of late years. The trawling commission of 1884–85 has reported to this effect, in so far as the subject of their inquiries is concerned. Other nations have adopted such a method of dealing with their fisheries, with good results and the promise of better.

2. The inquiries and operations necessary cannot be conducted as the result of private commercial enterprise: they must be national in character.

3. While the general trade returns of the fishing-industry on the one hand, and the practical enforcing of regulations as to the protection of fishing-grounds and the restriction of fishing-operations within certain seasons and localities, are matters with which an ordinary staff of officials can effectually deal, yet the chief purposes of the operation of a satisfactory fisheries department are of such a nature that only expert naturalists can usefully advise upon them and carry them out. It is therefore important that the organization of a state fisheries department should either be primarily under the control of a scientific authority, who should direct the practical agencies as to trade returns and police, or that there should be distinct and parallel branches of the department, — the one concerned in scientific questions, the other in collecting trade returns and in directing the fisheries police.

4. It does not appear that there is any ground for supposing that individuals of scientific training are *ipso facto* unfitted for administrative duties, and there would be obvious advantages in placing the operations of a fisheries department under one head. Indeed, it may be maintained that a scientific education, and capacity for scientific work, are likely to produce a more practical and enterprising director of such a department than could elsewhere be found. It has not been found desirable to place the administration of the botanical institution at Kew in the hands of a non-scientific director, and there is no obvious reason for avoiding the employment of a scientific staff in the case of a fisheries department. It is extremely important, from the point of view of the public welfare, that the state should not set the example of ignoring the value of scientific knowledge and training; while it is no less important to avoid the waste of public money which must result from employing officials who are not conversant with the matters with which they have to deal, in place of trained experts.

The nature of the work to be done, is, 1°, generally to ascertain what restrictions or modifications in the proceedings of fishermen are desirable, so as to insure the largest and most satisfactory returns, prospectively as well as immediately, from the fishing-grounds of the English coast and from English rivers and lakes; 2°, especially to ascertain whether existing fishing-grounds can be improved by the artificial breeding of food-fishes and shell-fish, and to determine the methods of carrying on such breeding, and to put these methods into practice; 3°, to find new fishing-grounds; 4°, to introduce new fish, — either actually new to the locality, or new to the consumer; 5°, to introduce (if practicable) methods of rearing and fattening marine fish in stock-ponds; 6°, to look after the cultivation and supply of bait; 7°, to introduce new baits, new methods of fishing, improved nets, improved boats, new methods of transport and of curing.

The work can be divided into two sections: A. Investigation; B. Practical administration.

*A. Investigation.* — The inquiries which are necessary in order to effect the purposes indicated above are as follows: —

1. A thorough physical and biological exploration of the British coasts within a certain distance of the shore-line, especially and primarily in the neigborhood of fishing-grounds. The investigation must include a determination of temperature and currents at various depths, the nature of the bottom, the composition of the sea-water, and the influence of rivers and conformation of coast upon these features. At the same time, the entire range of the fauna and flora must be investigated in relation to small areas, so as to connect the varying living inhabitants of different areas with the varying physical conditions of those areas, and with the varying association of the living inhabitants *inter se*. Only in this way can the relation of food-fishes to the physical conditions of the sea and to their living associates be ascertained, and data furnished for ultimately determining the causes of the local distribution of different kinds of food-fishes, and of the periodic migrations of some kinds of them.

2. A thoroughly detailed and accurate knowledge of the food, habits, and movements of each of the important kinds of food-fishes (of which about five and twenty, together with six shell-fish important either as food or bait, may be reckoned). The relation of each of these kinds of fish to its fishing-ground must be separately ascertained; its time and mode of reproduction; the mode of fertilization of its eggs; the growth of the embryo; the food and habits of the fry; the enemies of the young and of the adult; the relation of both young and adult to temperature, to influx of fresh water, to sewage contamination, to disturbing agencies, such as trawling and ordinary traffic.

3. An inquiry as to whether, over a long period of years, there has been an increase or decrease in the abundance of each kind of food-fish on the chief fishing-grounds as a matter of fact, together with an inquiry as to the actual take of each kind of fish in successive years, and, further, an inquiry as to any accompanying variation in (*a*) the number of fishing-boats, (*b*) the methods of fishing, (*c*) the climatic conditions, or other such possibly influential conditions as previous inquiry may have suggested.

4. An inquiry for the purpose of ascertaining experimentally whether the decrease in the yield of fishing-grounds, in regard to several species of food-fish, can be remedied (*a*) by artificial breeding of the fish; (*b*) by protecting the young; (*c*) by increasing its natural food; (*d*) by destruction of its enemies; (*e*) by restrictive legislation as to time or place of fishing, and as to size of fish which may be taken, and character of fishing-apparatus which may be used.

5. An inquiry to ascertain whether, if periodic, natural causes are at work in determining the fluctuations of the yield of fishing-grounds, their effect can be foretold, and whether this effect can in any cases be counteracted; similarly to ascertain, in the case of migratory shoal-fish, whether any simple and trustworthy means can be brought into operation for the purpose of foretelling the places and times of their migrations, so as to enable both fishermen and fish-dealers to be ready for their arrival.

6. An inquiry into the diseases of fish, especially in relation to salmon and other fresh-water fish.

*B. Practical administration.* — The chief heads under which this presents itself as distinct from the antecedent search for reliable data are —

1. The management of an efficient 'intelligence department,' giving weekly statistics of the fishing-industry, the appearance and disappearance of certain fish at particular spots, the number of fishing-boats employed, the methods of fishing employed, the meteorological conditions.

2. The advising and enforcing of restrictions by the legislature as to time, place, and method of capture of fish.

3. The artificial breeding and rearing of fish to stock-impoverished fishing-grounds.

4. The leasing and management of the foreshore and sea-bottom in particular spots, for the purposes of oyster-culture and mussel-culture, and of marsh-lands near the sea for the formation of tanks and fish-ponds.

5. The opening-up of new fishing-grounds and of new fish-industries (curing and treatment of fish for commercial purposes).

6. The introduction of new species of food-fish and shell-fish.

It is a matter of fundamental importance to determine, first of all, whether it is desirable that these matters should be dealt with by a permanent staff, or, on the other hand, by the occasional employment of a scientific man — not habitually occupied in these inquiries — to attempt the solution of any particular problem which an unskilled official may present to him. Clearly there must be economy in employing permanently certain naturalists who will familiarize themselves with this special class of questions, and become experts in all that relates to fishery problems.

Further, is it desirable that the matters which are to be inquired into should be determined by an official unskilled in natural history? or, on the other hand, that the selection of inquiries likely to lead to a satisfactory result should be made by a man of science, specially conversant with the nature of the things to be dealt with?

The organization required consists, so far as persons are concerned, of, 1°, a chief scientific authority; 2°, a staff of working naturalist-inspectors; 3°, a staff of clerks; and, so far as material is concerned, of, 4°, a London office, with collection of fishes, apparatus used in fishing, maps, survey-records, statistical returns, and library; 5°, a surveying-ship, under the orders of the department, to be manned and maintained by the admiralty; 6°, a chief laboratory fitted for carrying on investigations such as those named above, and also two smaller movable laboratories, together with steam-yacht fitted for dredging and sounding; 7°, hatching-stations and fish-ponds.

With regard to the foregoing headings, it is a matter for consideration whether the 'chief scientific authority' should be an individual, or a committee af five. The position assigned to this post should be equal to that of the director of the geological survey, or the director of the Royal gardens, Kew; or, if the 'authority' takes the

form of a committee, it should be placed on the same footing as the Meteorological council. The person or persons so appointed should be responsible for all the operations of the department, and of such scientific training and capacity as to be likely to devise the most useful lines of inquiry and administration.

The 'naturalist-inspectors' should be six in number, but operations might be commenced with a smaller staff. They should be thoroughly competent observers, and, under the direction of the chief scientific authority, they would be variously employed, either on the surveying-ship, at the chief laboratory, or in local laboratories, hatching-stations, or in the London office and museum.

The naturalists thus employed would become specialists in all matters relating to the life-history of fishes and their food : they would acquire a skill and knowledge far beyond that which it is possible to find among existing naturalists, who occasionally are requested to make hurried reports on such matters as salmon-disease, or the supposed injury of the herring-fisheries by trawlers.

One of the naturalist-inspectors should be a chemist and physicist, in order to report on the composition of the water and the nature of the bottom in the areas investigated.

'Clerks' would be required in the London office to tabulate statistics and carry on correspondence. These gentlemen need not necessarily have any scientific knowledge. It would probably be necessary to have a correspondent or agent of the department in every large fishing-centre. Probably the coast-guard officials might be taken into this service.

With regard to material equipment, it appears to be necessary that a scientific fisheries department should have at its London office a museum of fishing-apparatus for reference and instruction, and also complete collections illustrative of the fishes, their food, enemies, and other surroundings. In the same building would be exhibited maps showing the distribution and migrations of food-fishes, the coast temperature and its variations, the varying character of the sea-bottom, sea-water, etc.

The surveying ship or ships would be provided by the admiralty.

A central laboratory is in course of erection upon Plymouth Sound by the Marine biological association. Her Majesty's government has promised to contribute £5,000, and £500 a year, to this institution, on condition that its resources are available for the purpose here indicated. Certain of the 'naturalist-inspectors' (probably three at any one time) would be stationed at the Plymouth laboratory in order to carry on special studies of the development and food of particular species of fish.

The smaller movable laboratories, steam-yacht, and other appliances would not be costly.

RAY LANKESTER.

## NOTES AND NEWS.

WE learn from a letter of Professor Holden's, in the last number (2724–25) of the *Astronomische nachrichten*, just received, that the Lick trustees have decided to purchase from Messrs. Feil & Mantois a 36-inch crown disk, which was made by them at the same time with the crown disk of the objective now in the hands of the Clarks. The Clarks "have received the order to figure this disk as a third (photographic) lens for the large objective."

— The work of the U. S. fish commission shows most gratifying results in the artificial propagation of shad. An unprecedented abundance of these fish is noticed this season in all the rivers which have been supplied with young fish by the commission. This increase is noticed especially in the waters of the Pacific coast, where shad were unknown previous to their introduction by the U. S. fish commission.

— The New York assembly has passed the bill providing for the appropriation of twenty thousand dollars annually to the Metropolitan museum of art and the American museum of natural history, in order that they may be kept open to the public, free of charge, on Sundays. It is expected that it will soon be favorably reported by the senate committee, and become a law.

— The house committee on agriculture has reported favorably the bill to establish agricultural experimental stations in connection with the colleges established in the several states ; also the bill to enlarge the powers and duties of the department of agriculture, making it an executive department.

— The U. S. coast survey has issued the following charts, which are now ready for the public : Topographical sheets of the re-survey of the harbors of New York, Brooklyn, and Jersey City. It is intended to combine these sheets with the hydrographic work already executed, and thus to give an extended and accurate map of all the waters lying around New York City.

— An international maritime exhibition will be held in Havre, May 1 of next year, to be devoted to all kinds of sailing or steam ships, engines, life-saving contrivances, fisheries, and the products of the French colonies. Applications to

exhibit may be made to the Direction de l'exposition maritime internationale, 118 Rue de Paris, Havre.

— A Japanese invention for making paper of seaweed, says *Engineering*, is announced. It is thick in texture, yet sufficiently transparent to be used as a substitute for glass in windows.

— The total output of coal in France for 1885 was 19,534,341 tons.

— The total annual production of naphtha in Russia during the past year reached 1,800,000 tons, — a very great increase over that of preceding years; and already a foreign market, especially England, is sought for its consumption.

— On March 17 the Smith college branch of the Audubon society was organized. The society now numbers ninety members, and is thoroughly interested in the theoretical and practical work connected with ornithology. Meetings are to be held once a month, when the members will read papers embodying the results of original research, or will listen to lectures from well-known ornithologists. Field-work has been begun under the guidance of Mr. John Burroughs, who took parties of observers out into the woods and meadows to study the birds in their homes, and to learn their notes. For regular field-work, the society is divided into groups of ten, under the direction of some experienced member, who teaches them the art of intelligent and accurate observation. Each party goes out for observation at a stated hour in the day, twice a week.

— Statistics of Saxony, with its three million inhabitants, show a very large number of professional and industrial schools and students. There are 235, with 17,000 students in attendance. They are devoted to a great variety of branches of special and technical education. Three, with 270 students, are for instruction in the manufacture of toys; a like number, with 60 students, are devoted to spinning; 35 teach the art of ribbon-manufacture to 1,500 apprentices; and at Dresden there are 100 pupils at the German academy of weaving. There are 25 commercial schools, with 2,800 in attendance upon them. Of the industrial schools proper, there are three, — at Mitweida, Leipsic, and Chemnitz, — having nearly 1,000 students altogether.

— Dr. Werner Siemens has placed at the disposal of the German government the sum of $115,000, to establish an institute for carrying on experiments in natural science. It is proposed to erect a building in which studies in exact science may be prosecuted.

— The following field assignments of coast-survey assistants have been made: Assistant Dennis is now engaged on the re-survey of Long Island; Assistant Jardella has the district from Ward's Island east to Throg's Neck; Assistant Hosmer will take up the re-survey of the north shore of Long Island Sound on the 1st of June.

— An effort is being made in Washington to obtain some suitable position for Lieutenant Greely, who is unable to perform active army service on account of his health. To this end Senator Harrison of Indiana is urging the passage of a bill for the appointment of an assistant adjutant-general, which office is intended for Lieutenant Greely. It seems most fitting that this gallant officer should receive some recognition from his government for his heroic services.

— The fish-commission steamer Albatross arrived at Washington on Tuesday last.

— *Science observer* circular No. 66 contains the announcement of the discovery by Dr. Luther, apparently on May 4, of an eleventh magnitude asteroid. This becomes number 258.

— The new science hall at Smith college, which was begun last summer, is rapidly approaching completion, and will be formally opened and dedicated on Tuesday of commencement week (June 20). The principal address on this occasion will be given by Prof. J. P. Lesley of Philadelphia. The building is the gift of a friend of the college, whose name will be announced at the opening. It is of brick, with brown stone trimmings, three stories in height and about ninety feet long and fifty wide, with an ell thirty feet wide and some twenty-three feet in length. The well-lighted basement and the ground-floor are to be occupied by the departments of chemistry and physics, while the first and second floors are for the work in biology and geology and the collections belonging to these departments.

— The spring meeting of the Indiana academy of sciences will be held at Brookville, Ind., May 20 and 21. This will be the first meeting of the academy since its organization, and an invitation is extended to all those interested, to attend it.

— M. Bender, in the *Moniteur scientifique*, describes a new system of lighting. He employs the fatty residues obtained from the rectification of crude mineral oils, through which he passes a current of air. The air takes up a definite quantity of this hydrocarbon, and the flame produced is very brilliant, giving off no smoke.

— The outbreak of cholera in Europe at Brindisi, from which much was feared, appears from late news to be rapidly diminishing. There have been but few deaths; and intelligence from other parts

of Italy indicates, that, with the exception of the northern part of the Adriatic, the peninsula is quite free from the disease.

— Fish-commission car No. 1 left Havre de Grace, Md., on Sunday last, with 1,500,000 young shad for Broad and Saluda Rivers, South Carolina. On its return it will take the same number of shad fry to Portland, Ore., for stocking the Columbia River basin.

— The Hibbert lectures for 1886 are now being delivered in London on Mondays, Wednesdays, and Fridays, and are repeated at Oxford on Thursdays and Saturdays. The lecturer this year is Professor Rhys of Oxford, and his subject is 'The origin and growth of religion as illustrated by Celtic Heathendom.'

— Mr. D. P. Wainright of the coast survey has completed the trigonometrical work in the vicinity of Cape Fear River, North Carolina. The field-parties from the south will begin to arrive in Washington about the middle of June. Parties will be sent east and north for field-work about the first of June.

— The ethnological collections of the British museum are now said to be for the first time adequately displayed. New rooms, formerly occupied for zoölogy, have been devoted to them, and recently thrown open to the public. The collection is now thought to be the best and most representative in the world.

— Messrs. James Pott & Co. have brought out an edition of Pressensé's 'Study of origins,' which first appeared in its English version in December, 1882. The author is a learned and accomplished Protestant minister of Paris. His position is that of a Kantian who firmly believes in God, the soul, and the future life; but he is liberal and broad, vindicating the complete independence of science, and saying unequivocally that neither the Bible nor the councils have any prescriptive right to control science. He is convinced that experimental science is not hostile to the principles of theism; and that, if 'the possibility' of a divine and moral world be conceded, there are processes of experiment which will supply the demonstration. From this basis the author discusses the problems of knowledge, being, and duty in the light of modern German, French, and English philosophical writings.

— The publishing-house of Justus Perthes has recently begun a new edition of Berghaus's 'Physikalischer atlas,' which will contain seventy-five maps. The first *lieferung* contains a map showing the distribution of the flora of Europe; another, the isotherms of the world; and a third, the soundings in the Mediterranean and Black seas, and also the character of various portions of the shore, which is undergoing rapid changes.

## *LETTERS TO THE EDITOR.*

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

### A thunder-squall in New England.

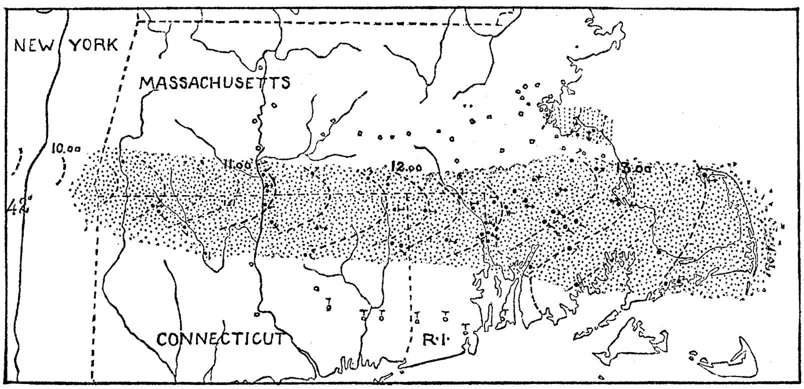
THE study of thunder-storms that was undertaken as a special investigation by the New England meteorological society in the summer of 1885 was successful in gathering records from a good number of volunteer observers, on which a tolerably complete statistical account of the storms may be based: thus there appears a distinctly earlier afternoon maximum of storm-frequency in western than in eastern Massachusetts, implying that distance from some at present unknown district of origin, as well as high temperature, exerts a control on the time of the storm's arrival east of the Hudson. In several of the better-developed storms the data accumulated were sufficient to define the more prominent physical features of the storm with considerable accuracy: this was especially the case with the small but violent thunder-squall that crossed New England about noon on July 21, 1885. The storm belongs to a class first clearly defined by Dr. Hinrichs, director of the Iowa weather-service, several years ago, and differs distinctly from the tornado in having a blast of outrushing air in front of its rain. The example here described came to us from western New York, where certain observations furnished by Prof. H. A. Hazen of the signal service reported it about six or seven o'clock in the morning: two of our observers in central and eastern New York recorded it at later hours; and at a little after ten o'clock it entered New England near the notorious Boston Corners, the former south-western angle of Massachusetts; thence it followed an almost due-east path, gradually broadening its rain-area, as it advanced, until it ran out to sea a little after noon, its average hourly velocity being forty-eight miles. All observers agree in giving it a rapid approach, a short, violent passage, and a quick disappearance. Very soon after its clouds were seen and thunder heard, the brief wind-squall came rushing in advance of the pouring rain; and an hour or so later the whole storm was out of sight in the east. With the wind came a rapid fall of temperature and a distinct increase of pressure. The thermograph, barograph, and anemograph curves, furnished from the city engineer's office in Providence, are here particularly interesting, as they record fluctuations produced by the nearly central passage of the storm. The temperature fell 13° in half an hour as the storm came overhead, and soon rose again to a high afternoon maximum as the clouds cleared away. The barometer quickly rose four-hundredths of an inch at the arrival of the storm, and the wind increased from a gentle breeze to a rate of about forty miles an hour.

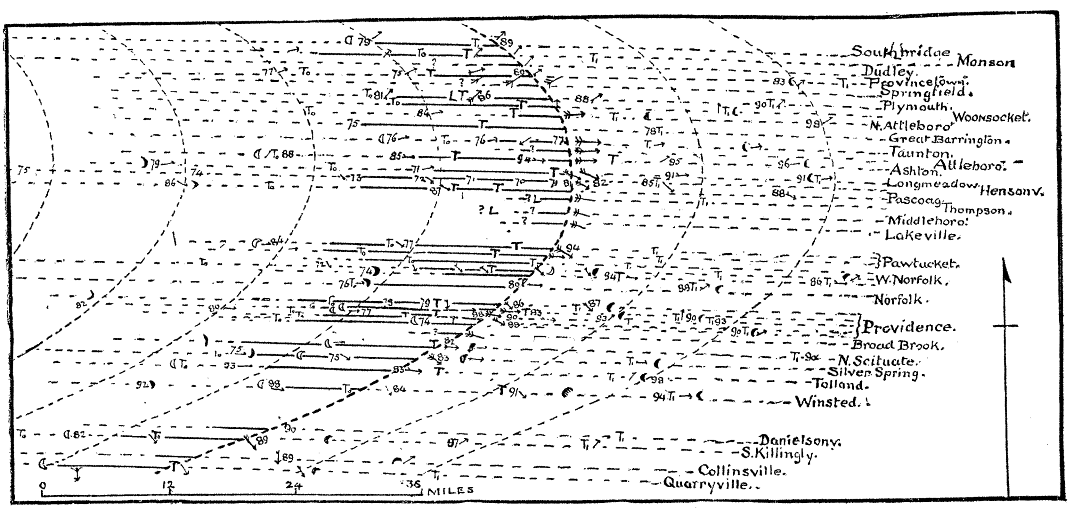
The persistent individuality of this storm, maintaining a constant association of its several features over the greater part of its observed path, justifies the construction of a 'composite portrait,' by means of which all the observations are thrown into their proper position with respect to two governing lines, — the rain-front and the storm-axis. In this figure, the curved lines, convex to the east, measure fifteen

minutes in time, or twelve miles in distance, ahead of or behind the rain-front; and the straight lines, parallel to the storm-axis, mark the paths of the several stations through the storm, as if they moved westward while the storm stood still. Appropriate figures and signs for temperature, wind, sky, etc., placed on the line of their station and at their proper time-interval before or after the beginning of the rain, then represent all the records that were gathered, and bring them together on a single diagram. Thus we see the gradual fall from high temperatures, as the clouds (shown by black crescents) became visible, and the thunder became audible; the sudden increase of the wind velocity, and its radial direction at the front of the rain-area; the longer duration of the rain, and the greater fall of temperature, at the centre than at the margin of the storm; the gradual warming-up again as the rain ceased and clear sky (white crescents) appeared.

The 'portrait' would doubtless have been truer if our stations had been more plentiful in north-eastern Connecticut and south-eastern Massachusets; but, in a first season's work, it was impossible to secure a sufficient number and an equable distribution of observers. Especial attention will be given to these requisites during the coming season, when the investigation will be continued with improved opportunities, and all careful observers will be encouraged to co-operate in the work. W. M. DAVIS.

Cambridge, Mass.




COMPOSITE OF THUNDER-SQUALL, JULY 21, 1885.

(*All observations thrown in their proper place with respect to rain-front and middle path.*)

Interval between curves, 15 minutes.
Numbers give temperature (F.).
$T_1$, T, $T_0$, first, loudest, last thunder.
☾, clouds in west.
☾, clear in west.
L, lightning-stroke.
——>, light wind.
⇶——>, heavy wind.
——, duration of rain.

## The Davenport tablets.

In the November number of the *American antiquarian* there appeared an editorial wherein it was charged that Rev. J. Gass, a member of the Davenport academy, by exchange had imposed upon Mr. A. F. Berlin certain alleged fraudulent mound-relics, and it was there plainly intimated that these disclosures tended to place all that gentleman's dis-

coveries under the ban of suspicion. In the January number, 1886, of the same magazine, there also appeared an elaborate attack by its editor upon the authenticity of the Davenport tablets, of which the Rev. J. Gass was a principal discoverer. In the March number there further appeared a communication from Mr. A. F. Berlin, containing the statements that Rev. Mr. Gass had made some exchanges, not with himself, but with Mr. H. C. Stevens of Oregon, and that most of the mound-relics sent by Mr. Gass to Mr. Stevens were 'modern' or fraudulent. These statements were submitted by the writer to Mr. Gass, and his explanations as furnished to me will be found in the following communication. This letter from Mr. Gass was written in German; and the translation herewith furnished for publication was made by Prof. William Riepe, who was formerly connected with the public schools of this city, and subsequently revised by Carl L. Suksdorf, Esq., principal of the German free school. It is proper to state that Mr. Gass preaches and teaches in German, and as his few English letters, on account of his imperfect knowledge of the language, are usually dictated to an impromptu amanuensis, they but imperfectly represent his precise meaning.

The publications in the *Antiquarian* were made without communication with the Davenport academy, and without affording Mr. Gass an opportunity for explanation. In correspondence with Mr. Berlin, the writer represented that Mr. Gass should have an opportunity to inspect the relics in question, and requested that they should be forwarded to the Davenport academy for this purpose. This request was declined. The statement of Mr. Gass should have appeared in the *Antiquarian;* but as we are denied admission to its columns, except under restrictions neither the Davenport academy nor Mr. Gass could accept, we shall have to ask of you the favor of its early publication.

In conclusion, permit me to say, that, while the members of the Davenport academy have the most unbounded confidence in the integrity and good faith of Rev. Mr. Gass, it should be stated that the question of the authenticity of its inscribed tablets does not by any means wholly depend upon his reliability. As may be seen from our published statements, there were other persons present at the discovery of these relics, and certificates as to the facts made by these well-known and highly esteemed citizens are preserved among the archives of the academy. These additional evidences have never yet been given to the public, and, when published, will furnish strong corroborative proof of the genuineness of the relics in question.

It is always to be deplored when personal considerations enter into scientific discussions, but in archeological research, where the question of the authenticity of relics so largely depends upon the integrity of the explorer, character becomes an important factor, and is a legitimate subject for inquiry. In cases like that under consideration, however, this moral test should be sternly applied alike to the accuser and the accused. Charles E. Putnam,

*President Davenport academy of sciences.*

Davenport, Io., May 6.

[Communication from Rev. J. Gass.]

Charles E. Putnam, Esq.

*Dear Sir,* — In accordance with your request, I will hasten to give you an account, so far as it is still now possible for me to do, of my transactions with Mr. H. C. Stevens of Oregon City, Ore., in regard to the relics in question.

I formerly often received letters and circulars offering me relics, or wishing to exchange or buy from me. Among others I received also in April, 1881, a postal-card from Mr. Stevens. This I handed to our curator of the academy, Mr. W. H. Pratt, as I had not the least intention to make any exchange with him myself. To our curator, however, the offer was quite welcome, and he authorized me to write to Mr. Stevens that he was willing to make such exchanges. Mr. Stevens immediately sent a number of relics which pleased us all very well. At this time, I do not know positively whether before or after I had seen those articles, awoke in me the very unhappy wish, as it now appears, to possess a few good small arrow-heads to be used as charms for my little daughter. I therefore collected what was in the house, the best of which was a small box of flint implements which I had received from Rev. C. Mutschmann of Missouri. All these were of a primitive character, and therefore not of especial value for our museum. Among the objects received from Pastor Mutschmann there were a small stone axe, an Indian stone pipe, and also fragments of such a one. The pipe had about the following form:

It was of grayish color, rough, without polish. The broken one was of a similar character. Pastor Mutschmann wrote to me at that time that he was told that the pipe was found in an Indian grave on the Missouri River, I believe in St. Charles or Warren county. I took the pipes and other relics without any doubt as to their genuineness, and did not test them in any way. I supposed the material to be gray pipe-stone.

I packed all, as I had received them, in two paper boxes, and sent them by mail to Mr. Stevens. Thereupon I received from him a number of small arrow-heads, of which a few were nice and whole, but the most were broken. At the same time I received a letter from Mr. Stevens, in which he remarked that the articles sent were not worth the postage I had paid, for it was all broken, worthless stuff. In my answer I endeavored to defend the relics as not being entirely worthless; and, somewhat hurt and irritated by what I considered the unjust remarks of Mr. Stevens, I have, as I now see, somewhat overestimated the value of those articles. He remarked at the same time that the pipes were not old (ancient) Indian pipes, but were modern, made by white people; at least, some one had told him so. I gave no credit to this statement, but took it for an empty excuse made in order to give me little or nothing for them. If I had entertained the *least* doubt of their genuineness, I would not, under any circumstances, have sent them; or at least, after Mr. Stevens had made these remarks, I should certainly at once have asked them, and taken them back at any price.

As to who has written my letters for me, I cannot now say positively. Mrs. Gass says it was certainly done by one of my pupils, and I believe she is right. A letter in German, written by myself, would surely have sounded quite differently. These unfortunate letters have, however, been sent in my name, and with my name, and I must now abide the consequences, come what will. I can scarcely under-

stand, even now (supposing that Mr. Berlin's copy of my letter is correct), how the incorrect statement that the academy had bought such pipes, and paid such high prices for them, could have occurred unobserved. The boy who wrote the letter for me must have misunderstood me, and from my ignorance of the English language I overlooked this error. It may be, that, not attaching much importance to this letter, I may have sent it without first examining or looking it over.

In regard to the relics in question, it is impossible at present for me to determine whether those which Mr. Stevens *claims* to have received from me are actually *the* objects which I have sent him; for I have not seen them as yet, and for the present shall have no opportunity, as Mr. Berlin has informed you that he could not send them for my inspection without the consent of Mr. Stevens. On the contrary, Mr. Stevens says that they no longer belong to him, but to Mr. Berlin.

Immediately on receiving your first communication on this matter, I resolved to send back to him the arrow-heads received in exchange, and to request him also to return those which he claimed were *not genuine* to me. Mr. Stevens returned the package to me, and refused to give me back those which he claimed I had sent to him, with the excuse that they were no longer in his possession, as he had given them to Mr. Berlin. Hence obviously it is impossible for me to determine as to the correctness of the statements made by those gentlemen concerning said relics. Their refusal to allow me to inspect the objects is very strange and perplexing to me.

As Mr. Stevens informs us that many of the relics I sent him were thrown out in the yard on a pile of other rejected relics, and have been lying there some years exposed to the weather, it is no wonder they became, as he says, considerably changed in appearance, and the labels lost. Under these circumstances, and after so long a time, it must have been very difficult for him to select the relics in question, and to distinguish them with certainty from those received from other sources in his extensive exchanges. I have no doubt, if I could see the relics, I should recognize many or most of them, unless they have been so changed by Mr. Stevens as to be no longer recognizable. Until this opportunity is afforded, the present account of the transaction must suffice.

That the intention or the thought of having any thing to do with doubtful relics, or of deceiving any one with them, was far from my mind, will, to you, scarcely require any special assurance from me.

J. GASS.

Postville, Io., April 10.

The above is a correct translation from the German of a communication written by Rev. J. Gass to Charles E. Putnam, Esq., bearing date April 10, 1886.

CARL L. SUKSDORF.
WM. KIEPE.

Davenport, Io., May 4.

### What was the rose of Sharon?

An interesting question is renewed, in a late number of the *Edinburgh review*, on 'What was the rose of Sharon?' It is very possible that some of the readers of *Science* may be able to throw further light upon the subject, or at least give trustworthy opinions as to the merits of 'crocus,' 'narcissus,' or 'reed.' The extract is, I hope, of sufficient interest to merit republication: it is as follows: —

"The 'rose of Sharon' has long been a disputed point. The Hebrew word *khabatseleth* occurs only in Canticles ii. 1, and Isa. xxxv. 1. The Revised version reads 'rose' in the text, and 'autumn crocus' in the margin. We are of opinion that the narcissus (N. tazetta) is intended. The scene of the Canticles is in the spring, when the narcissus would be in blossom: it is very sweet, has long been and still is a plant of which the orientals are passionately fond. Hasselquist noticed it on the plain of Sharon; Tristram, in cultivated land and lower hills from Gaza to Lebanon; Mr. H. Chichester Hart, in the districts between Yebdna and Jaffa (plain of Sharon). 'Some low-lying patches,' he says, 'were quite white with it.' The October quarterly statement (Palestine exploration fund) contains a valuable paper by Mr. C. Hart, entitled 'A naturalist's journey to Sinai, Petra, and South Palestine, made in the autumn of 1883.' The autumn crocus has no perfume, and would not be in bloom till late in the year. The narcissus is a bulbous plant, which is apparently implied in part of its Hebrew name; i.e., *betsel* (a 'bulb,' an 'onion'). But quite a different plant has very recently appeared as the claimant to the honor of being the 'rose of Sharon:' an Assyrian plant name is introduced to us by Dr. F. Delitzsch. Among the names of different kinds of *kânû* ('reed') and of objects made of it, occurring on a tablet in the British museum, and published in 'The cuneiform inscriptions of western Asia,' mention is made of one called *khabatsillatu*, which in sound is identical with the Hebrew name in Canticles and Isaiah; so that Dr. F. Delitzsch, without a moment's hesitation, upsets all other floral aspirants with one decided blow, and reads 'reed of Sharon,' 'the desert shall rejoice and sprout like the reed.'" C. W. T.

### Thermometer exposure and the contour of the earth's surface.

Various writers during the last hundred years, and perhaps earlier, have called attention to the marked differences of temperature which are frequently to be found in clear weather between hill-tops and adjacent valleys. Recently Hann and Woeikof in Europe have written numerous papers on the subject; and in this country instances have been given by J. W. Chickering, jun., and S. Alexander (*American meteorological journal*), Professor Mendenhall (*Science*), Professor Hazen (Professional paper of the signal service, xviii.), and Prof. W. M. Davis (*Appalachia*). But attention has not generally been attracted to the bearing these differences of temperature have on the subject of thermometer exposure.

My attention was drawn to the subject by the marked differences of temperature which were reported by different observers at Ann Arbor, Mich., during the cold period of the winter of 1885; and, in order to study the subject, a regular series of observations were begun between the astronomical observatory at Ann Arbor and an adjacent valley through which ran the Huron River. The bottom of the valley was about a hundred and fifty feet lower than the land on each side of it, and was about a quarter of a mile distant from the side on which stood the observatory. The method employed was to obtain the temperature at the observatory by means of a sling thermometer; then descending the

hill, and whirling the thermometer, to read it at intervals until the bottom was reached. A return trip was then begun, and the temperature obtained again at the top of the hill. Later, minimum thermometers were similarly exposed at both places, and their readings compared. Early on clear mornings, and at night, the temperature was usually found several degrees lower in the valley, and differences of ten degrees were not uncommon. At 7 A.M. on the morning of Feb. 18, the temperature at the observatory was $3\frac{1}{2}°$ below zero. On descending the hill, the thermometer fell rapidly, and at the bottom of the valley read 18° below zero. The fall was greatest along the steepest decline, and in one place fell three degrees within twenty-five feet. Returning, the thermometer rose rapidly, and at the top of the hill again read $3\frac{1}{2}°$ below zero.

During the continuance of these observations, Professors Pettee and Schaeberle kindly consented to take simultaneous observations of temperature with those at the observatory. One lived about a mile to the south-west, and the other about the same distance to the west. Professor Pettee was at about the same level as the observatory, and his readings differed but little from the observatory readings; but the observations taken at the home of Professor Schaeberle, which was at a considerably lower level, several times gave temperatures ten degrees lower than those at the observatory. These lower temperatures, observed both in the adjacent valley and at the home of Professor Schaeberle, were only found at night and on clear, quiet mornings, and disappeared in the middle of the day and in cloudy weather. They were due, no doubt, to the fact that the air most cooled by radiation, or by contact with the earth's surface thus cooled, was heaviest, and sunk to the lowest levels. In the middle of the day the temperature was usually found slightly higher in the valley than at the observatory.

It seems evident, then, that for scientific purposes which are intended for the study of temperature changes over large sections of country, and where stations can only be obtained many miles apart, it is necessary to avoid these merely local differences of temperature; and the only method of eliminating them is to get above them: in other words, wherever irregularities in the earth's surface exist, the thermometer should be on, or at least as high as, that of any considerable portion of land surrounding it, and not in valleys. The thermometer should, if possible, be away from buildings, and as many feet above ground as convenient. The best form of shelter is probably that devised and described by Professor Hazen. I have found by comparison that thermometers placed in accordance with these considerations differ but little in their readings, though they are many miles apart in a horizontal direction. But scientific people should not fall into the error of supposing that thermometers so placed represent the temperature over the adjacent country. The position is merely that in which local influences are attempted to be avoided; and it is not safe to say to persons that their observations must be erroneous because they differ from those of the signal service or some observatory.

This is a subject I think well worthy of the consideration of those in charge of state weather services. H. HELM CLAYTON.

Blue Hill observatory.
Readville, Mass., April 16.

## Double vision.

Since my earliest boyhood, or for more than fifty years, I have had double vision and stereoscopic eyes, which I have probably exercised more than a million times. I have exercised the double vision to such an extent that it has become to a certain degree compulsory, as, if I look at an object forty feet more or less distant, all intervening objects are doubled involuntarily.

I often stereoscope (if that be a good verb) wall-papers and carpets, if figures be of proper size, arrangement, and distance. This has a wonderful effect, producing the following changes: the walls of an ordinary room are apparently thrown to a distance of a hundred feet, and are proportionately increased in size. Any defects in the putting-on of the paper will exhibit themselves in the same manner as I shall mention when describing the effects on gratings or lattice-work. The borders of the paper, if not 'stereoscoped' at the same time, with all pictures, etc., on the walls, will remain at their proper distances, and seem suspended in the air, like Mohammed's coffin. The surface of the paper is also remarkably increased in brilliancy. In 'stereoscoping' common photographs, they are thrown to a much greater distance, and the proper stereoscopic effect is brought about in the middle one of the three. I suppose this accounts for the increased size of the walls of rooms when so treated.

What has bothered me the most is the effect on gratings and lattice-work. In a piece of lattice-work, say, eight by ten feet, and the eyes five feet distant, the work is broken up, and has, instead of a common surface, an apparent depth of three or four feet. In some places there will be but a single piece; in other places two or three will be together with their parallelism properly preserved. I suppose that it is brought about by irregularities in the construction of the diagonals in the structure; but I do not know enough about optics to explain this peculiar breaking-up, and differences in apparent distances of the different pieces making up the work. The same effects are produced in looking down at gratings in pavements. GEO. KELLER, M.D.

Bucyrus, O., May 10.

## Partition of Patagonia.

The geographical note on the 'Partition of Patagonia' in the current issue of *Science* (No. 170) calls to mind your recent strictures on cartographers for failing to keep our school maps up to the times. It would be but fair to state that the cartographers are not delinquent in this instance. The treaty of partition was concluded at Buenos Ayres, July 23, 1881, — five years ago. For the last three years all our more popular school geographies have shown the boundaries of Chili and the Argentine Republic as determined by this treaty. RUSSELL HINMAN.

Cincinnati, May 10.

## An old-time salt-storm.

Can any of your readers tell me the exact date of the so-called 'salt-storm' which came upon the coast of Massachusetts about 1815? As described by old inhabitants, there was a high wind and heavy rain, and the houses and all objects within a mile of the water were coated with salt. Are such storms of frequent occurrence, and what is their explanation? H. C.

Salem, Mass., May 10.

# SCIENCE.—SUPPLEMENT.

FRIDAY, MAY 14, 1886.

## CROSS-FERTILIZATION OF PLANTS BY BIRDS.

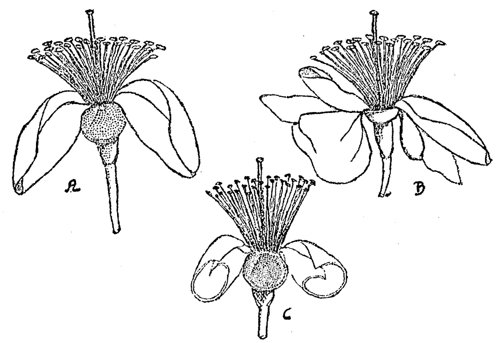
ADAPTATIONS for cross-fertilization exist in an almost endless variety throughout the vegetable kingdom, and have afforded a wide field for study and speculation to biologists. Many of great interest have been described by Hermann Müller as occurring in South American plants; and now the well-known South American naturalist, Fritz Müller, adds in *Kosmos* (1886, i. 93-98) a very remarkable discovery of adaptation to cross-fertilization by birds, — the first case of the kind, it is believed, that has been observed in the vegetable kingdom.

The flowers of the common European myrtle, with their delicate white corolla and crown of white stamens and simple pistil, are familiar to all. Very similar are the white flowers of the trees and shrubs belonging to the numerous species of the genera Campomanesia, Psidium, Myrcia, and Eugenia of the same family (Myrtaceae), occurring in great abundance in South America. Many of the species blossom in such profusion that the trees appear nearly white, and the pleasant odor that not a few give off attract bees and other insects in great numbers; and while in many others the flowers are not so conspicuous, and the perfumes not so evident, yet the pollen is easily transferred from flower to flower, and tree to tree, by the agency of insects.

In this uniformity among the genera and species a singular exception is found in the 'goiabo do campo,'— a not uncommon tree in the higher lands of Brazil, and widely known for its excellent fruit. The single species belong to the genus Feijoa; and its popular name, as well as its mode of growth and its foliage, recalls the wide-spread common guava-tree (Psidium pomiferum).

The flowers are found usually at the extremity of the twigs, or more rarely in the axils of the leaves, in groups of from two to five, on short stems. The leaves in whose axils the flower-stems, or the twigs bearing them, occur, are reduced to rudimentary bracts; and the flowers, for this reason, are more conspicuous than they would be were they enveloped by leaves, as is usual in the allied genera. A yet more especial adaptation to the means by which they are fertilized is the duration of flowering, which extends for months, during the entire spring, single blossoms appearing here and there over the tree.

The sepals form two pairs, — those of the one about six millimetres in length, and of equal breadth; of the other, twice as long and a little wider. In the unfolding of the blossom they are turned downwards, and present only the dark reddish-brown inner side. The petals at first are




BLOSSOMS OF FEIJOA, FIVE-EIGHTHS NATURAL SIZE.

about fifteen millimetres long and as many broad, firm and leathery, and arched outwards; the inner side, of a purplish-red color. Within a day they grow to double the length and breadth, and so roll up longitudinally that they form a tube not more than one-third of the width, the leaves of the two pairs rolling or turning in opposite directions.

Together with these changes in size and shape, there are others in color and taste. The external side of the petal, all that is now visible, becomes pure white, contrasting with the dark background of the sepals; and instead of being thickened and tasteless, or with a slight acrid taste, as is usual in so many of its congeners, like the clove and other species, it has now become soft and very sweet, and without any acridity.

The dark blood-red stamens, to the number of about fifty or sixty, are about eighteen millimetres in length, thickened and stiff, and expanding above into a crown more than an inch in diameter. The anthers lie horizontally, and liberate their bright yellow pollen nearly at the same time that the petals reach their complete development. The single pistil is likewise firm and stout, and extends above the plane of the anthers. As an unusual occurrence, there were found at one time

flowers in which one or more of the sepals had been transformed into petals, as shown in fig. B; and, from their evident relation to each other, the author notices the fact as deserving the attention of those who would speculate upon laws of variation and heredity.

From the description it will be seen that the flowers are conspicuous, having deep-yellow pollen, dark blood-red stamens and pistil, snow-white petals, and dark sepals, all unhidden by the foliage. But, notwithstanding this conspicuousness, the flowers are seldom visited by bees, there being, as was found, little or no nectar or honey to attract them. Even in cases where bees were observed upon the flowers, the prominent pistil did not readily admit of fertilization. The author was surprised, however, to find that soon after blossoming very many of the petals were severed near the middle, or at the base, by a single strong incision. By watching he soon discovered the cause to be birds of the genus Thamnophilus. These birds, of which the male is black and the female brown, alighted usually upon a branch above the one on which a flower was in bloom, and, reaching downward, bit off the petals; but, in so doing, either the neck or forehead invariably came in contact with the anthers, and brushed off the pollen, leaving the flower as seen in fig. C. Whether birds of this genus, especially in the more normal habitat of the tree in the higher lands of Brazil, are the only agency of cross-fertilization, or whether other birds share in it, remains to be discovered.

In Europe it is only exceptionally that birds are attracted by flowers. Sparrows sometimes bite off the flowers of the yellow crocus, and the bullfinch will pluck with inherited dexterity that portion of the under part of the primrose which contains honey. No adaptation has hitherto ever been observed where such mutilations of the blossom were of direct advantage to the plant, and the present example of Feijoa is therefore the more remarkable for the high degree of perfection which this adaptation has reached. Instead of the sweet petals being spread out for ornament alone, out of which the bird could pluck but a small portion, they become rolled up, thus permitting a larger part to be bitten off, and presenting greater attractions. The stout, firm anthers, and pistil, are likewise adaptive, insuring the clinging of the pollen to the feathers of the bird, and thus its ready transportation from one blossom to another.

How these adaptations have been brought about can scarcely be conjectured, as the genus is widely removed from the allied genera, and there are no intermediate forms.

## *PROFESSOR HUGHES ON SELF-INDUCTION.*

THE recent researches of Prof. D. E. Hughes, president of the Society of telegraph engineers and electricians, have been extended by him, and his latest results will be published in a forthcoming number of the *Society's journal.* We are enabled to give some account of these researches from an account published in *Engineering.*

The extra resistance of a wire during the 'variable period,' that is to say, when the electric current entering it is rising to its normal strength, has been shown by Professor Hughes to proceed from an extra current of opposite name self-induced in the wire. He finds, however, that there are cases in which this effect is reversed, so as to produce less resistance in the wire during the variable period. Such cases occur when extremely fine wires are being tested with powerful currents; for the steady current heats the wire, thus introducing an extra resistance. The induction-bridge of Professor Hughes enables him to study and analyze these effects, tracing them to their true cause.

Professor Hughes has lately been investigating the self-induction of coils, as well as of straight wires, and the following table gives his result:—

| Coils formed of 3 metres of silk-covered copper wire 1 millimetre in diameter, each coil being 3 millimetres in diameter. | Comparative force of the extra currents. |
|---|---|
| One coil alone | 100 |
| Two similar coils in series | 174 |
| Two similar coils in parallel, but separated 5 centimetres from each other | 55 |
| Same two coils in parallel, but superposed | 81 |
| One single coil of thicker wire of exactly the same form, length, and resistance as the two coils in parallel | 75 |

This table shows an increase of the self-induction when the two coils are in series, but not quite double the effect, as there is an increased or added resistance. This result is well known; but a more interesting result is obtained where the two coils are parallel and separate, giving 32 per cent less self-induction than when they are superposed, and 26 per cent less than that of a single coil of the same resistance. Professor Hughes traces this result to the reaction of contiguous coils on each other.

With regard to the self-inductive capacity of non-magnetic wires of different metals, but of the same lengths and diameters, Professor Hughes finds that when non-inductive resistances, say, of carbon, are added to the wires to bring them to equal resistance, there is apparently no difference in the self-inductive capacity of all the metals he has yet tried; but if, instead of adding a supple-

mentary resistance of carbon, the wires are taken of the same length and resistance, their diameters being different, he finds a marked difference in their inductive capacities. For instance: a pure copper wire, compared with a brass one of double the diameter, shows a much higher self-induction; and Professor Hughes remarks in this connection, that, as the diameter increases, the reactions of the current in the contiguous parts of the wire on each other become less. The following table gives some fresh values of the electromotive force of self-induction currents in wires and strips one metre long, that of a chemically pure copper wire one millimetre in diameter being taken as 100:—

*Wires of the same diameter, but of different resistance, 1 metre in length.*

| | |
|---|---|
| Soft Swedish iron | 500 |
| Copper | 100 |
| Brass | 65 |
| Lead | 50 |

*Wires of the same resistance, but of different diameter, 1 metre in length.*

| | |
|---|---|
| Soft Swedish iron | 400 |
| Copper | 100 |
| Brass | 88 |
| Lead | 81 |

*Strips of the same width and thickness, but of different resistance, 1 metre in length, 12 millimetres wide, 1-10 of a millimetre thick.*

| | |
|---|---|
| Copper | 60 |
| Brass | 48 |
| Iron | 45 |
| Lead | 85 |

*Strips of the same resistance and thickness, but of different widths, 1 metre in length, 1-10 millimetre thick.*

| | |
|---|---|
| 12 millimetres wide (copper) | 60 |
| 42 " " (brass) | 45 |
| 72 " " (iron) | 39 |
| 96 " " (lead) | 29 |

In the above table, wires of the same diameter follow in the order of their resistance, iron alone being the exception. The same order is preserved in wires of the same resistance, but of different diameters. In the latter case there is a nearer approach to equality, but they still show a difference of from 12 to 19 per cent; and, while the non-magnetic metals have increased their inductive capacity with increased diameter, iron has fallen 20 per cent: consequently wires of different metals of the same resistance have not the same inductive capacity, owing, probably, to the action of contiguous portions of the current, as Professor Hughes has already shown.

If we reduce the extra currents by employing thin sheets or strips, there is, in the case of iron, a still more remarkable difference, for in strips of different metals of the same width the force of the extra currents in iron is actually less than that in brass; and if we compare an iron strip with an iron or copper wire of the same resistance, we have, iron 500, copper wire 100, and an iron strip 45, or 55 per cent less than the copper wire.

In the case of wires a nearer approach to equality in inductive capacity is shown when they are of the same resistance, but in strips this is reversed; for here, when equality in resistance is produced by wider strips, the difference becomes greater, iron then having actually less inductive capacity than a lead wire of the same resistance. Professor Hughes attributes this remarkable result not only to the reactions of contiguous portions of the current being less in sheets or strips than in wires, but also to an imperfect formation of the circular magnetism which takes place in iron wires on the passage of an electric current. He has tried all forms of conductors, such as those of square, stellar, and tubular section; and all of them show a diminution of inductive capacity as compared with wires of solid circular cross-section. In solid conductors the maximum self-induction appears in those of circular section, and the minimum in wires formed into a flat strip.

While re-affirming his statement that the best lightning-rod is a flat strip of copper, or a galvanized iron strand wire, Professor Hughes has made experiments with American compound wires consisting of a steel core coated with copper, or a copper core coated with steel. He finds that the copper coating has an enormous influence in reducing self-induction in the steel. Without it the self-induction was found to be 350 as compared with a copper wire giving 100, whereas with it the self-induction was only 107, or 7 per cent more than copper alone. This effect is explained by the fact that the circular magnetism created by the passage of a current through an iron wire is produced chiefly on the exterior portion of the wire; and if this is of copper, it is practically suppressed. On the other hand, copper wire coated with steel has a greatly increased self-induction as compared with copper wire uncoated. It even has a higher self-induction than a solid iron wire, and its resistance in the variable period is proportionally greater than that of a soft iron wire. Professor Hughes has made numerous experiments on this point; and they all show, that, while copper in a straight wire or a single *wide* loop has a far lower inductive capacity than iron, it has, on the other hand, the property of being far more excited by the reaction of iron, so that a straight copper wire can be excited by this reaction to a degree greatly exceeding that of a straight iron wire under precisely the same conditions. Some of Professor Hughes's experiments illustrating this point may be cited, as they are of much practical importance. A

copper and an iron wire of equal resistance, 1 metre in length, were measured for inductive capacity and resistance, the capacity of the copper wire being taken as 100, and the iron being 400. The copper wire showed an increased resistance, during the variable period, of 8 per cent, as compared with 128 per cent for iron; but a great change took place when each of these was placed in the interior of an iron gas tube of sufficient diameter to allow of the wire being insulated. The force of the extra currents in the copper wire then increased 350 per cent, while in the iron they increased 8 per cent, the force of the extra currents being now, for copper 450, and for iron 433.

The influence of an iron tube on the resistance of the variable period was still more marked. The copper wire which, without the exterior iron tube, had only 8 per cent increase, now showed 934 per cent; or, by direct measurement, 1 metre of this wire, during the rapid rise and fall of the current in the variable period, had a resistance the same as 10.34 metres in the stable period, — a much greater difference than was obtained with iron wire, which only showed an increase of 22 per cent. Thus copper shows three times the sensibility to an iron sheath which iron does, a fact of importance in electrical engineering. Iron is much less affected in self-induction by exterior influence than copper. Copper coils are much more sensitive to iron cores within them than iron coils, and the resistance of a copper coil may be in the variable period far more than that of an equal iron coil, if an iron core react within it. It is this fact, however, as Professor Hughes points out, which enables copper coils to be so effective in transforming energy in 'secondary generators;' and he remarks that a dynamo having its electromagnet and armature wound with insulated iron wire, would, irrespective of its resistance, have an extremely low efficiency as compared with one wound with copper. As regards the resistance of either of those wires, Professor Hughes observes that there can be no doubt that the resistance of the armature of a dynamo, or, in fact, of any coil of wire, as measured during the stable period, gives no approximate indication of what its real resistance is during the period in which it is doing work. This remark bears out a recent suggestion to the effect that the resistances of conductors, apparatus, and standards, as measured by battery currents in the stable period, differ to some extent from their values when traversed by the rapidly fluctuating currents of a dynamo. A further investigation of the matter is required in order to find out its practical importance, if any.

The following table shows the influence of an iron tube surrounding a straight iron or copper wire compared with compound wires: —

| WIRES IN IRON TUBE, EACH 1 METRE IN LENGTH. | Comparative electromotive force of the extra currents. | Approximate comparative increased resistance during the variable period (that of the stable period being taken as 1.) |
|---|---|---|
| Copper wire 2 millimetres diameter, alone | 100 | 1.08 |
| Same wire insulated in the interior of the iron tube | 450 | 10.34 |
| Same joined in the tube at both ends | 275 | 10.00 |
| Same in contact with the tube throughout its length | 200 | 7.83 |
| Compound wire (copper interior with steel exterior) | 325 | 4.35 |
| Soft Swedish iron, 2 millimetres diameter, alone | 400 | 2.28 |
| Same wire insulated in the interior of the iron tube | 433 | 2.78 |
| Same joined to the tube at both ends | 240 | 2.70 |
| Same in contact with the tube throughout its length | 215 | 2.60 |
| Compound wire (steel interior, copper exterior) | 107 | 1.20 |

This table shows that the iron tube has a much greater effect on the copper wire than on the iron wire, the effect in both cases being at its maximum when the tube is insulated from its central conducting wire; for, while the wire is in contact with its tube, there is evidently a shunt action, or eddy current, between the outer coating and the central portion. This Professor Hughes has measured by means of a telephone between the wires and its sheath, and also between two concentric sheaths. When the sheath is joined to the wire at both ends, the electromotive force of the extra current is reduced, but the resistance during the variable period is little altered. If, however, as in a coated wire, the wire and sheath are in contact throughout, there is a marked decrease in this resistance. Thus Professor Hughes is of opinion that the shunting effect takes place locally and probably transversely. The passage of an electrical current then takes place with less opposing resistance from self-induction than would be the case if there were no internal partial neutralization of the extra currents.

## ORIGIN OF FAT IN ANIMALS.

SINCE the researches of Dumas, Milne-Edwards, and others on insects, and those of Persoz and Boussingault on geese, it has been established that the animal organism has the power of elaborating fatty matters. It was formerly believed that such

matters were received already formed with the food, and that the *rôle* of the animal organism was merely to accumulate them. The vegetable organism, it was thought, was alone able to form them.

In comparing the quantities of fat stored in the bodies of those animals experimented upon with those known to have been introduced with the food, they were found to be considerably greater. It was shown, that, of the thousand grams daily increase in weight of an ox, six hundred or more were due to an accumulation of fat, while the ingested matters contained less than half of that quantity; so that it is rendered certain that a large proportion, if not all, of the fat in the animal body, is due to sources other than fatty foods. What these sources are, is an important question, the answer to which has not been satisfactory. It has commanded much attention, especially in Germany, within late years, and has given rise to numerous controversies. It is a subject, also, of no little importance, since obesity in man is often an infirmity, and sometimes a grave disease. It will therefore be of interest to present such facts, in connection therewith, as have been so far experimentally demonstrated, as given by A. Sanson in the *Revue scientifique*.

Pettenkofer and Voit kept during a number of days, in a suitable respiration apparatus, a dog which received daily given quantities of dried starch and fat, and ascertained that the dog eliminated, under the form of carbonic acid, not only all the carbon of the ingested starch, but also a portion of that of the fat. It was therefore concluded that the starch thus decomposed did not serve in the formation of the fat. This formed the basis of a theory, on Voit's part, that the formation of fat was due to the reduction of albuminoid matters by the oxygen of respiration. According to this theory, the alimentary substances which we call carbohydrates — that is to say, starch, glycogen, sugars — take no part whatever in the formation of fat. These are decomposed in the organism, furnishing material for the animal heat, and resolving themselves into carbonic acid and water. The albuminoid matters — the proteines — are only in part thus decomposed, and furnish, besides, urea and fat.

This theory of Voit, which was in reality a very ingenious hypothesis, was immediately accepted throughout Germany, though Henneberg showed by chemical calculation that 100 grams of albumen thus used would not furnish more than 51 grams of fat in addition to 33 of urea and 27 of carbonic acid. It is necessary to remark, however, that, in the numerous experiments performed by Voit and his disciples in support of this hypothesis, they were not able to verify it directly. It is impossible, in fact, to sustain the life of an animal nourished exclusively by albumen.

Taking as a point of departure the data of Henneberg's calculations and the facts established by the experiments, it has not been difficult to show that Voit's hypothesis is inadmissible by reason of its impossibility. The geese upon which Persoz experimented were found to have formed over 4,000 grams of fat, while their food, completely deprived of fat, contained but 1,400 grams of proteine, — a quantity sufficient to form but a little more than 700 grams of fat. Other experiments of the same nature show the impossibility even in a more striking degree. A cow which gained at the rate of 1,600 grams per day stored up daily nearly 1,000 grams of fat, but an analysis of the food with which she was supplied showed only sufficient albuminoid matters to furnish about half that quantity.

These and other experiments have established reasons, now generally received, for the belief that herbivorous animals do not depend upon albuminous foods for the sources of fat, but that the fat is in a large part derived from the carbohydrates.

Very lately Rübner has repeated the researches of Pettenkofer and Voit, and reached opposite results. He placed in the respiration apparatus a small dog weighing a little more than six kilograms, and gave it food composed of 85 grams of starch, 100 grams of cane-sugar, and 4.7 grams of fat. During ten days, in which it was kept under these conditions, it was found to have eliminated 87 grams of carbon. The entire quantity of carbon introduced by the food was 176 grams, of which 89 were retained in the organism, and served in the formation of fat, 76 of which must have been derived from the carbohydrates. From these facts he concludes that the carbohydrates are demonstrated to be a source of fat in the carnivores as well as in the herbivores and omnivores. These researches of Rübner destroy absolutely the value of those by Pettenkofer and Voit; and one can feel assured that the German theory of the dependence exclusively upon albuminoid matters in the formation of fat in the animal organism will no longer obtain acceptance. In these organisms, as in the vegetable, the fatty matters are formed by the carbohydrates furnished in abundance in the food.

No more definite conclusions, however, in regard to the proper composition of food to produce fattening, can be reached from a knowledge of these facts. In alimentation every thing depends upon digestion. Every thing must be adapted to

the individual aptitude, and the proportions of carbohydrates and albuminoid matters must bear mutual relations dependent more or less upon physiological processes. Too strong or too feeble, as regards the digestive power of the individual considered, the proportion of the carbohydrates exerts an influence either upon its own digestibility or upon that of the albuminoids which accompany it; and in either case it has a depressing effect upon digestion. But, as regards a regimen preventive or remedial of obesity, the case is different. It is evident, that, if the formation of fat is dependent upon carbohydrates, a diet composed largely of them, so often practised, can only be an error so far as obesity is concerned.

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## *A DARING ECONOMIST.*

THIS is a day of free lances in political economy. Its doctrines, its premises, its methods, are being subjected to every conceivable kind of criticism; but, of all the kinds, that represented by Mr. Patten's book is perhaps the rarest. He adopts the deductive method of English political economy, and in the main adopts also its premises; but by throwing special emphasis on such of these premises as he conceives have been insufficiently borne in mind, as well as by insisting on some others which he himself introduces, he arrives at most important conclusions very much at variance with those commonly accepted. But it is not so much this position which we have just outlined that makes the book somewhat exceptional, as the fact that Mr. Patten unquestionably understands the doctrines which he criticises. Not only does he understand them, but he gives ample evidence of such logical acumen and practical insight as might fit him to contribute to the improvement and extension of economic knowledge. Yet we are compelled to say that his book, on the whole, is most unsatisfactory; that while a reader who is well versed in economic theory, and who keeps himself constantly on the guard against the author's calm confidence in the completeness of his own argument, may find in it some suggestions which would repay attentive study, to the general reader it is full of snares and pitfalls.

We have touched upon the secret of the author's failure to produce a sound contribution to economic criticism. He seizes upon a feature which seems to him to have been slighted by previous writers; he drags it to the light, and wishes to compel a recognition of its importance in order to give the theory a completeness which it did not before possess; in his eagerness to do this, he comes to look upon his own supplement as the complete doctrine; and what in due subordination to the old teachings might have been a useful idea, becomes in this way a source of confusion and paradox. The author, moreover, exhibits a large share of that quality which has so frequently destroyed the utility of economic writing, — a disposition to exaggerate the differences between his own views and those of previous writers, — and, in his ardent pursuit of the consequences of a pet notion or discovery, loses sight of the principles which he elsewhere shows he has understood. The only safeguard against defects of this sort is a profound sense of one's own liability to err in matters of so subtle and complicated a nature as those with which our author deals, and such a feeling of respect for the great thinkers of the past as would compel one to examine a question most carefully from every point of view before deciding that they were in the wrong. This is not the spirit that animates Mr. Patten: his book is full of bold statements of fact and theory, for which the author seems to think that no further justification is necessary than that they fit in easily with the general considerations which, from his point of view, are most prominent. The result is, that, in addition to a sketchiness and incompleteness quite inconsistent with the weighty character of the subjects discussed, the book is marked by logical oversights of the gravest nature, which almost or quite neutralize the effect of the author's ability.

To justify this estimate of his book by an examination of the several arguments advanced by Mr. Patten would require an amount of space not much less than that occupied by the book itself. We must confine ourselves to one or two illustrations. The first chapter is devoted to a criticism of the Ricardian doctrine of rent. The principal objection here advanced against the theory rests on the fact that the extension of the field of cultivation requires an initial expenditure for clearing the land and fitting it for agriculture. This expenditure will not be incurred unless the owner can expect to receive as rent the ordinary profit on his initial expenditure of capital; but, the expense once incurred, the land will not be withdrawn from cultivation as long as it can merely yield the usual return for the labor and capital annually expended upon it. "It is clear, therefore," says Mr. Patten, "that the laws which regulate the bringing of new lands into cultivation, and those according to which land will be withdrawn from cultivation, are very different, and that there is a large margin within which the

*The premises of political economy; being a re-examination of certain fundamental principles in economic science.* By SIMON N. PATTEN. Philadelphia, *Lippincott*, 1885. 12°.

price of food may vary without a change in the quantity produced." A little reflection will show that there is a fatal oversight in this argument. It is true that people will not incur a considerable expense in preparing new land for cultivation unless the price of produce is sufficient to enable it to pay rent; but there is no reason whatever to suppose that the land so brought into cultivation is the worst land in use. There might be a considerable fall in the price of food before the land last brought into use at great expense was thrown out of cultivation; but other and worse land would be thrown out of cultivation, or, what is the same thing economically, it would be less completely cultivated. If the Campagna were drained, no one supposes it would be the worst land in Italy; and, although a considerable fall in the price of Italian produce might afterwards take place without throwing the Campagna out of cultivation, this is not the same as saying that no land in Italy would be thrown out of cultivation. Mr. Patten thinks that the consideration of the expense of bringing new land into cultivation shows that there is no land which does not pay rent: in reality it merely shows that what is chronologically the last land to be cultivated is not always the land which pays no rent. In this, no Ricardian will be disposed to quarrel with him.

Strange to say, Mr. Patten, throughout this chapter, altogether ignores the possibility of reducing production by applying less capital to land, which is economically equivalent to withdrawing bad land from cultivation. In one of the last chapters he denies the truth of the law of diminishing returns; the law, namely, that after a certain point additional applications of labor and capital to a given portion of land yield a smaller return than former applications did. If Mr. Patten's position on this point were correct, the Ricardian theory would be sadly shaken. Mr. Patten fancies the true law to be that of limited returns, not diminishing returns; and, this fancy having taken hold of his mind, he devotes the main part of a chapter of thirty pages to trying to show that "the proportional return might increase up to a point beyond which no additional return could be obtained by any amount of labor." This is as much as to say that it would pay a farmer to apply all the care and all the expense required for fertilizing, draining, watering, and so forth, which was requisite for getting from the soil the largest amount of produce it was physically capable of producing. The position is disproved by the practice of every plain farmer, and by the experience of every 'model' farmer; and only the fatuity of a man in love with his own 'discovery' can account for Mr. Patten's curious effort to prove the contrary. In point of fact, he does not always bear in mind what it is that he is contending against, as when he says (p. 160), "If no other result were obtained from improved processes than this better utilizing of labor, this result would more than counteract any tendency there may be towards diminishing the return from agriculture." This is not in the least pertinent to the question; what economists assert is, that, with *given* processes, capital and labor applied to the soil beyond a certain point produce diminishing proportional returns.

The third chapter is devoted to a consideration of the law of population. One of the worst cases of easy-going refutation which occur in the book is furnished by the way in which Mr. Patten disposes of the method by which Malthus arrived at his conclusion. "He found that in new colonies, where the tendency has the fewest checks, population frequently doubles itself in twenty-five years, and then concluded that this rate of increase represented the natural force of the tendency, and that this was the rate at which population always tends to increase. There are many objections to this method of reasoning which will quickly appear when we apply it to the investigation of other subjects. . . . By the same method of reasoning we could prove that all men are natural drunkards, cannibals, adulterers, and murderers, since we find communities in various parts of the world where drunkenness, cannibalism, etc., are common." A schoolboy ought to perceive the difference between the two cases. What Malthus found was, that men of the same race, the same civilization, the same religion, the same traditions, multiplied at a much more rapid rate when placed in circumstances which permitted of the easy support of an increasing population than they did when living in an old and thickly settled country. The differences in the rate of increase were observed in the case of like peoples — often of the same people — in different circumstances; and it is ridiculous to put this on a level with a comparison between totally different peoples. If Mr. Patten had reflected that Malthus was neither a fool nor a vain man, but a man profoundly impressed with the importance of arriving at the truth concerning the law of population, he would have been slow to suppose that Malthus' position could be so easily overthrown: and if, after writing his chapter, he had carefully re-read his Malthus, he would have found that most of his criticisms had been very thoroughly answered by Malthus himself.

We shall look at one more example of the way in which Mr. Patten, in spite of understanding an economic law, goes astray through an unques-

tioning confidence in any apparent correction of it which may occur to him. He says that economists justly call attention to the waste of labor and capital caused by protection, but that they omit to notice a precisely similar waste, on a much larger scale, which is produced by free trade. To illustrate his point, he says, that, if Portugal has an advantage over France in the production of oranges, then, if a protective duty caused the planting of a few orange-groves in France on land which might have been more productively employed otherwise, economists would cry out against the waste. But the same effect may be brought about by free trade, if the world's demand for oranges is so great that the appropriate land of Portugal and similar countries is insufficient to supply it; the French land is then brought into requisition through the operation of free trade; and yet the economists make no outcry against it, says Mr. Patten, though the land is as surely diverted from its best use as it would be by a protective tariff. But precisely here is Mr. Patten's fallacy. There is no natural unit for comparing oranges with any thing else, as grapes, for example. What is meant by saying that on a given piece of land we can raise more grapes than oranges? Simply that the crop of grapes has more commercial value than that of oranges. When the demand for oranges has increased, the same quantity of oranges has a greater value than before, and the land is now better adapted for oranges than for grapes. Mr. Patten forgets that the Frenchman could still raise grapes as before: he prefers to raise oranges because the world at large will give him more for them than for the grapes. Mr. Patten may, indeed, reply, that, in point of fact, the grapes were capable of doing more good to the world than the oranges; but economists do not assert the contrary of this, or pretend that production is regulated by any absolute standard of utility. They know very well that people do not produce what is best for their fellows, but what their fellows most desire.

The title of Mr. Patten's book does not convey a correct idea of its contents, for it deals quite as much with questions of social improvement as it does with the primary laws of political economy. If we look in it, not for fundamental criticism, but for suggestions of additions to economic theory, and still more of improvements in economic practice, we may find, as already intimated, a number of things that would well repay attention. The importance of attending to the results of different economic arrangements in determining the character of the individuals who will survive and perpetuate their kind is made justly prominent throughout the book, and is probably its most valuable feature. It is not, however, carefully and impartially worked out, but is everywhere intermingled with the misleading criticism of economic doctrines which we have endeavored to characterize. In the discussion of free trade, Mr. Patten rightly calls attention to the importance of inquiring into its effects on distribution, the effect on production alone not being decisive of its desirability; and in various parts of the book there are suggestive remarks on the bad influence of a low rate of interest upon the chance which the poorer classes have of improving their condition. But both in discussing these matters and in proposing remedies, the author is almost always content to follow out the consequences of a single idea, instead of giving the subject that sober and comprehensive consideration without which no discussion of this nature can be useful, except by way of suggesting to others who are more careful, and more free from prepossessions.

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THE annual report of the North Carolina experiment-station for 1885 deals almost wholly with fertilizers and soils; but an experimental farm is about to be established in connection therewith, so that henceforth greater attention will be devoted to other less strictly chemical subjects. The station was established chiefly to give protection to the farmers of the state in the purchase of fertilizers, and its utility seems proved by the marked increase in value of the fertilizers in the market, and the rapid decrease of their actual cost price. Among the fertilizers to which attention was directed, are cottonseed-hull ashes; and it is of interest to note that the total possible annual output of these ashes in the United States is estimated at over twenty-five thousand tons, valued at over eight hundred thousand dollars, though less than half this amount has hitherto been actually obtained. The vast quantities of phosphatic rock lately discovered in the state have drawn attention to the possibility of utilizing the pyritic deposits for the obtaining of sulphuric acid, to be used in the manufacture of fertilizers. A report by Mr. A. Winslow advances the opinion that the plan is deserving careful attention. Should it prove practical, Carolina, as well as other southern states, will be benefited very materially in its agricultural industries.

—It is said that experiments have been successfully made on the Indus valley railway in running locomotives fired with petroleum, and that it seems likely that the frontier railway-engines will before long derive their fuel from the oil-wells near Sibi.